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EXAMINER

CHEN, KEATH T

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/813,543	Applicant(s) GEALY ET AL.	
	Examiner KEATH T. CHEN	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-69 is/are pending in the application.
- 4a) Of the above claim(s) 17-28 and 55-69 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 and 29-54 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03/30/2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Non-entry of preliminary amendment

1. Applicant's lack of response to the notice of non-compliance, mailed on 02/05/2008, results in non-entry of the preliminary amendment, filed on 03/30/2004 which withdraw claims 1-16 and 29-54 without a restriction/election requirement. As a result, the originally filed claims 1-69 will be regarded as the original claims.

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-16 and 29-54, drawn to apparatus, classified in class 156, subclass 345.
- II. Claims 17-28 and 55-69, drawn to method, classified in class 427, subclass 248.1.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case apparatus as claimed can be used to practice another and materially different process such as analyzing impurities in insulating layer.

Restriction for examination purposes as indicated is proper because all these inventions listed in this action are independent or distinct for the reasons given above

and there would be a serious search and examination burden if restriction were not required because one or more of the following reasons apply:

- a. the inventions have acquired a separate status in the art in view of their different classification;
- b. the inventions have acquired a separate status in the art due to their recognized divergent subject matter;
- c. the inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries);
- d. the prior art applicable to one invention would not likely be applicable to another invention;
- e. the inventions are likely to raise different non-prior art issues under 35 U.S.C. 101 and/or 35 U.S.C. 112, first paragraph.

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a invention to be examined even though the requirement may be traversed (37 CFR 1.143) and (ii) identification of the claims encompassing the elected invention.

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement

will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected invention.

If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

2. During a telephone conversation with Mark S. Matkin on 3 March 2008, a provisional election was made without traverse to prosecute the invention of Group I, claims 1-16 and 29-54. Affirmation of this election must be made by applicant in replying to this Office action. Claims 17-28 and 55-69 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “the at least one surface ... of the exhaust foreline” of claim 51 must be shown or the feature(s) canceled from the claims. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Interpretation

Applicant claim language “means for” in claims 29-35” will be treated under 35 U.S.C. 112 6th paragraph (MPEP 2181).

“means for providing a surface acoustic wave” will be treated as acoustic wave drivers; a piezoelectric transducers (applicant’s specification, 2nd paragraph of page 10); or interdigital electrodes (2nd complete paragraph of page 11).

“means for providing a first precursor gas” will be treated as gas inlet (#140 of Fig. 1; showerhead is optional).

“means for removing a portion of the first precursor gas” will be treated as pump (first paragraph of page 7) and purge gas, as defined in claims 32 and 33. However, gas identity is intended use, see discussion on intended use below.

“means for introducing a purge gas” and “means for introducing a second precursor gas” will be treated as gas inlet (#140 of Fig. 1; showerhead is optional). However, gas identity is intended use, see discussion on intended use below.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-6, 10, 14-16, 29-30, 32-41, 45, 49-50, and 52 are rejected under 35 U.S.C. 102(b) as being anticipated by Bennett et al. (US 5367139, hereafter '139).

'139 teaches all limitations of:

Claim 1: An apparatus (Figs. 6 & 7), comprising: a chamber (#10, col. 9, lines 31-34) adapted to receive a first precursor gas (Fig. 4, SiF₄, col. 18, line 12; However, gas identity is intended use in the apparatus claim); at least one surface interior to the

chamber (the inner surface of chamber wall #30); and an acoustic wave driver (pulse generator #54 and power supplies #50-52 and acoustic transducers #61 and #62, col. 16, lines 18-29; also named piezoelectric transducers T #34, col. 9, lines 17-19 in Fig. 1) coupled to the at least one surface and adapted to drive acoustic waves along the interior surface.

Applicant's claim requirements "precursor gas(es)" are considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP 2111.02).

Claim 2: The apparatus of claim 1, wherein the acoustic wave driver (#61 and #62) is adapted to drive the surface acoustic wave in a selected range of frequencies (by using pulse generator #54, col. 16, lines 26-29; see also col. 11, lines 62-65).

Claim 3: The apparatus of claim 2, wherein the range of frequencies is selected based upon the composition of the first precursor gas (the apparatus is capable being selected by precursor composition or mass).

Applicant's claim requirements "frequency is selected ..." are considered intended use in the pending apparatus claims. Further, it has been held that claim

language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Claim 4: The apparatus of claim 3, wherein the range of frequencies is selected based upon a mass of the molecules in the first precursor gas (intended use).

Claim 5: The apparatus of claim 4, wherein the range of frequencies has a midpoint frequency, and wherein the midpoint frequency is decreased when the mass of the molecules in the first precursor gas is increased (intended use).

Applicant's claim requirements "midpoint frequency is decreased/increased ..." are considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Claim 6: The apparatus of claim 4, wherein the range of frequencies has a midpoint frequency, and wherein the midpoint frequency is increased when the mass of the molecules in the first precursor gas is decreased (intended use).

Claim 10: The apparatus of claim 1, wherein the acoustic wave driver comprises at least one transducer (#61 or #62, col. 16, lines 18-21).

Claim 14: The apparatus of claim 1, wherein the at least one surface comprises an interior surface of the chamber (inner surface of #30).

Claim 15: The apparatus of claim 1, further comprising a pump (vacuum throat #31, col. 9, lines 31-34, see also col. 17, lines 58-61) coupled to the chamber (#10) and operable to evacuate the first precursor gas from the chamber (pump is capable of evacuate precursor gas).

Claim 16: The apparatus of claim 1, wherein the chamber is adapted to receive a second precursor gas (NF₃ or CF₄, col. 17, line 49. However, gas identity is considered intended use).

Claim 29: An apparatus (Figs. 6-7), comprising: means for providing a surface acoustic wave to at least one surface in a chamber (acoustic transducer #61-62, col. 16, lines 18-21); means for providing a first precursor gas to the chamber (inlet, col. 17, line 36); and means for removing a portion of the first precursor gas from the chamber (pump, vacuum throat #31, col. 9, lines 31-34, see also col. 17, lines 58-61; and nitrogen, abstract and col. 16, lines 59-60. Gas identity is intended use).

Claim 30: The apparatus of claim 29, wherein the means for providing the surface acoustic wave comprises means for providing the surface acoustic wave having

the selected range of frequencies (by using pulse generator #54, col. 16, lines 26-29; see also col. 11, lines 62-65).

Claim 32: The apparatus of claim 29, wherein the means for removing the portion of the first precursor gas comprises a pump (vacuum throat #31, col. 9, lines 31-34, see also col. 17, lines 58-61).

Claim 33: The apparatus of claim 29, wherein the means for removing the portion of the first precursor gas is a purge gas (nitrogen, abstract and col. 16, lines 59-60. Gas identity is intended use).

Claim 34: The apparatus of claim 29, further comprising means for introducing a purge gas (nitrogen, abstract and col. 16, lines 59-60. Gas identity is intended use) into the chamber to remove at least a portion of the first precursor gas (in conjunction with pump).

Claim 35: The apparatus of claim 29, further comprising means for introducing a second precursor gas (NF_3 or CF_4 , col. 17, line 49. However, gas identity is considered intended use) into the chamber after removing at least a portion of the first precursor gas (the apparatus is capable of sequence of addition/removal).

Claim 36: A processing chamber (Figs. 6-7, #10) for performing an atomic layer deposition process (the apparatus is capable of by proper sequencing the operations), comprising: a chamber (#10) having at least one inlet (inlet, col. 17, line 36) through which a first precursor gas (SiF_4 , col. 18, line 12; However, gas identity is intended use in the apparatus claim) and a purge gas (nitrogen, abstract and col. 16, lines 59-60. Gas identity is intended use) may be (optional property) introduced into the chamber; and an

acoustic wave driver (#61 and #62) coupled to a surface interior (inner surface of #30) to the chamber, the acoustic wave driver being operable to generate a surface acoustic wave along the surface.

Claim 37: The processing chamber of claim 36, wherein the acoustic wave driver is adapted to drive the surface acoustic wave in a selected range of frequencies (by using pulse generator #54, col. 16, lines 26-29; see also col. 11, lines 62-65).

Claim 38: The processing chamber of claim 37, wherein the range of frequencies is selected based upon the composition of the first precursor gas (the apparatus is capable being selected by precursor composition or mass).

Applicant's claim requirements "frequency is selected ..." are considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Claim 39: The processing chamber of claim 38, wherein the range of frequencies is selected based upon a mass of the molecules in the first precursor gas (intended use).

Claim 40: The processing chamber of claim 39, wherein the range of frequencies has a midpoint frequency, and wherein the midpoint frequency is decreased when the mass of the molecules in the first precursor gas is increased (intended use).

Applicant's claim requirements "midpoint frequency is decreased/increased ..." are considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Claim 41: The processing chamber of claim 39, wherein the range of frequencies has a midpoint frequency, and wherein the midpoint frequency is increased when the mass of the molecules in the first precursor gas is decreased (intended use).

Claim 45: The processing chamber of claim 36, wherein the acoustic wave driver comprises at least one transducer (#61 or #62, col. 16, lines 18-21).

Claim 49: The processing chamber of claim 36, wherein the at least one surface comprises an interior surface of the chamber (inner surface of #30).

Claim 50: The processing chamber of claim 36, further comprising a pump (vacuum throat #31, col. 9, lines 31-34, see also col. 17, lines 58-61) coupled to the

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chamber and operable to evacuate the first precursor gas from the chamber through an exhaust foreline (vacuum pump inherently consist of foreline).

Claim 52: The processing chamber of claim 36, wherein a second precursor gas (NF₃ or CF₄, col. 17, line 49. However, gas identity is considered intended use) may be (optional property) introduced into the chamber through the at least one inlet (col. 17, line 36).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
5. Claims 7-8 and 42-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over '139, in view of Koinuma et al. (US 5569502, hereafter '502).

'139 teaches all limitations of claims 1-2 and 36-37, as discussed above. '139 further teaches the use of piezoelectric acoustic transducer (col. 9, lines 17-19) on the chamber wall to produce pressure wave (col. 11, lines 28-37) to reduce particle

contamination, the frequency is chosen to minimize the transduction impedance and to maximize the gettering of suspended particles (col. 11, lines 62-65) or the mass of particulates (col. 11, lines 23-27); or in using surface (col. 15, lines 18-21) acoustic wave in acoustic stress (col. 16, lines 14-32); and the surface acoustic wave and pressure wave can be combined (col. 17, lines 4-5); but is silent on the details of acoustic transducer design.

'139 does not teach the limitations of:

Claims 7: The apparatus of claim 2, wherein the selected range of frequencies is chosen from an overall range of about 100 Hz to about 200 kHz.

Claim 8: The apparatus of claim 1, wherein the acoustic wave driver comprises at least one pair of electrodes.

Claim 42: The processing chamber of claim 37, wherein the selected range of frequencies is chosen from an overall range of about 100 Hz to about 200 kHz.

Claim 43: The processing chamber of claim 36, wherein the acoustic wave driver comprises at least one pair of electrodes.

'502 is an analogous art in the field of semiconductor (col. 5, lines 35-36) deposition (plasma CVD and PVD, col. 5, lines 27-32; '139, col. 13, lines 3-12), particularly in detail of generation of surface acoustic wave (col. 2, lines 18-26). '502 teaches a pair of comb-shaped electrodes (Fig. 3, #32 and #32', col. 6, lines 1-6) on piezoelectric (#31 made of lithium niobate, col. 6, lines 1-3, is a piezoelectric, col. 4,

lines 58-59) with frequency from 0.1 to 1000 Hz (col. 7, lines 64-66) to provide a surface acoustic wave (col. 2, lines 18-26).

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have adopted the comb-shaped electrode pair, as taught by '502, to the piezoelectric acoustic transducer (T #34 in Fig. 1 or #61-62 in Figs. 6-7) of '139, as a suitable design for the piezoelectric acoustic transducer. The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, U.S. 327, 65 USPQ 297 (1945).

For claims 7 and 42, '139 discloses the claimed invention except for frequency range. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to optimize the frequency range, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). The frequency is a result effective variable as taught by '139 (col. 11, lines 62-65).

6. Claims 11-12 and 46-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over '139, in view of Shinriki et al. (WO 02/15243, hereafter '243). (US 6806211 is cited for corresponding English version of the '243).

'139 teaches all limitations of claims 1 and 36, as discussed above. '139 further teaches a liner (col. 16, lines 45-48) in thermal stress mode. However, '139 is silent on the liner material and the chamber wall material.

'139 does not explicitly teach the limitation of:

Claim 11: The apparatus of claim 1, wherein the at least one surface comprises a surface of a piezoelectric liner (not shown in the Fig., col. 16, lines 47-48) deployed in the chamber.

Claim 12: The apparatus of claim 11, wherein the piezoelectric liner is a quartz liner (not shown in the Fig., col. 16, lines 47-48).

Claim 46: The processing chamber of claim 36, wherein the at least one surface comprises a surface of a piezoelectric liner (not shown in the Fig., col. 16, lines 47-48) deployed in the chamber.

Claim 47: The processing chamber of claim 46, wherein the piezoelectric liner is a quartz liner (not shown in the Fig., col. 16, lines 47-48).

'243 is an analogous art in the field of semiconductor processing (abstract), particularly in contamination (last paragraph of page 26, see US 6806211 for corresponding English version, hereafter '211, col. 18, lines 48-52). '243 teaches quartz liners (Fig. 19, #202A-B, 2nd paragraph of page 26 or '211 col. 18, 2nd paragraph, and #201d, 2nd paragraph of page 27, or '211 col. 18, last paragraph), for the purpose of

avoiding contamination (last paragraph of page 26 or '211, col. 18, lines 48-52).

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have added quartz liner, as taught by '243, to the apparatus in Figs. 6-7 of '139, for the purpose of avoiding contamination. The quartz liner would have been part of the "at least one surface comprises ..." of claims 11-12 and 46-47.

7. Claims 9 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over '139 and '502, further in view of 'T Hoen (US 4518889, hereafter '889).

'139 and '502, together, teach all limitations of claims 8 and 43, as discussed above. '139 further teaches the use of piezoelectric acoustic transducer (col. 9, lines 17-19) on the chamber wall to produce pressure wave (col. 11, lines 28-37) and the use of lateral wave is used to direct the particle (col. 9, lines 57-61) to sweep the particles away from the critical regions of the wafer (col. 9, line 35-38). '502 teaches a plurality of comb-shaped electrodes 32 and 32' in parallel arrangement to generate different frequency simultaneously (col. 6, lines 7-11).

'139 and '502, together, do not teach the limitations of:

Claim 9: The apparatus of claim 8, wherein the pair of electrodes is a pair of apodized electrodes.

Claim 44: The processing chamber of claim 43, wherein the pair of electrodes is a pair of apodized electrodes.

'889 is an analogous art in the field of piezoelectric ultrasound transducers, particularly in apodized transducer (field of invention). '899 teaches apodized electrodes by shaping the applied electric field through use of different electrode geometries, which is similar to '502's multi-pairs of electrodes, on opposite sides for the purpose of improving off-axis intensity (col. 2, lines 2-11) and improved directivity (field of invention).

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have apodized the pair of electrodes, as taught by '889, in the combination of '502 and '139, for the purpose of improving directivity (field of invention), to suit the purpose of direct particles (of varying mass) away from the critical regions of wafer surface ('139, col. 9, lines 57-61 and lines 35-38).

8. Claims 13 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over '139 and '243, in view of Oehrlein et al. (US 5798016, hereafter '016).

'139 and '243, together, teach all limitations of claims 11 and 46, as discussed above.

'139 and '243, together, do not explicitly teach the limitations of:

Claim 13: The apparatus of claim 11, wherein the at least one surface comprises a plurality of piezoelectric liners.

Claim 48: The processing chamber of claim 46, wherein the at least one surface comprises a plurality of piezoelectric liners.

'019 is an analogous art in the field of semiconductor etching (abstract; '139, col. 6, lines 5-10), particularly in preventing particle formation (col. 5, lines 41-47; '139, col. 3, line 54-58). '019 teaches quartz (col. 5, line 27) liners (#37 and #39, Fig. 3a; col. 5, lines 57-60) for the purpose of preventing particle formation (col. 5, lines 41-47).

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have added multiple liners to the reaction chamber, as taught by '019 to the apparatus in Figs. 6-7 of '139, for the purpose of preventing particle formation (col. 5, lines 41-47).

'139 and '243, together, disclose the claimed invention except for multiple piezoelectric liners. It would have been an obvious matter of design choice to duplicate quartz liners, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.

9. Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over '139, in view of Okase (US 5678989, hereafter '989).

'139 teaches all limitations of claim 50, as discussed above.

'139 does not teach the limitations of:

Claim 51: The processing chamber of claim 50, wherein at least a portion of the at least one surface is within at least a portion of the exhaust foreline.

'989 is an analogous art in the field of manufacturing process of semiconductor (col. 4, lines 41-43), particularly in protection against contamination (col. 5, line 12). '989 teaches exhaust pipe coated with quartz for the purpose of protection against contamination (col. 5, lines 10-13).

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to added liners to the exhaust pipe/foreline, as taught by '989 to the apparatus in Figs. 6-7 of '139, for the purpose of protection against contamination (col. 5, lines 10-13); therefore, the at least one surface is the quartz liner for the chamber and quartz coating in the exhaust foreline, both adapted to drive acoustic wave along the interior surface because being piezoelectric.

10. Claims 31 and 53-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over '139, in view of Campbell et al. (US 6461436, hereafter '436).

'139 teaches all limitations of claims 29 and 54, as discussed above. '139 is silent on the details of gas delivery system.

'139 does not explicitly teach the limitations of:

Claim 31: The apparatus of claim 29, wherein the means for providing the first precursor gas comprises a valve coupled to the chamber.

Claim 53: The processing chamber of claim 52, wherein the at least one inlet comprises first, second, and third inlets through which the first precursor gas, the purge gas, and the second precursor gas, respectively, may be (optional property) introduced into the chamber.

Claim 54: The processing chamber of claim 36, wherein the at least one inlet comprises a first inlet through which the first precursor gas may be introduced into the chamber and a second inlet through which the purge gas may be introduced into the chamber.

'436 is an analogous art in the field of ALD (field of the invention, a kind of CVD), particularly in avoiding clogging of the foreline from precursor (col. 1, lines 45-47). '436 teaches (Fig. 1) two precursor delivery lines (inlets #14, #16, col. 2, lines 50-52 and col. 3, lines 21) and one purge gas delivery line (inlet #12, col. 3, lines 1-3 and 15-16), each with a valve and a inlet.

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have added the precursor/inert gas inlets and valves, as taught by '436, in Figs. 6-7 of '139, for its suitability. The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of

obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, U.S. 327, 65 USPQ 297 (1945).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEATH T. CHEN whose telephone number is (571)270-1870. The examiner can normally be reached on M-F, 8:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/K. T. C./

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